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MONTHLY REVIEW

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Next Month CLEVELAND NUMBER—Reports Must Reach Editor by June 11th

A man should never be ashamed to say he has been in the wrong, which is but saying in other words that he is wiser today than he was yesterday.—Pope.

MONTHLY REVIEW

Published by the

American Electro-Platers' Society

Editors' Office, 4156 Botanical Ave., St. Louis, Mo.

Vol. 8 MAY No. 5

CO-OPERATION

The question of Industrial unrest that prevails generally today is a question that our membership feels itself deeply concerned with. We are interested industrially and financially in the electro deposition and finishing of metals, and have in our possession knowledge gained from membership in the A. E. S. that will will be of some assistance in helping to solve this problem. The very foundation of our society is education and the dissemination of knowledge, each individual obligates himself to protect the interest of all.

Therefore we must take our part in helping to solve this question in the plating departments by increasing production. The only solution plainly is to lower production costs, in other words to speed up production. Experience has shown that if you give the worker an incentive in his work and open the way to promotion and greater opportunities, that he will work harder and faster to gain the reward than before. Everyone is ambitious to make all the money he can and the joy of achieving more today than yesterday. Some workers seem to think that we are still in the days of sailing ships and stage coaches. Let us hope that these views will be corrected, the sooner the better for all concerned.

Every employer is willing and eager to have the co-operation of the department executives in helping to solve the problem of production. The A. E. S. members are in far better position to act more intelligently on this question due to the fact that we have a "Monthly Review" which contains a volume of knowledge and valuable information, also we have our Branch Society meetings, where all questions pertaining to increased production are given serious consideration.

The co-operation of the Foreman Electro Plater is a big factor in a number of our large industrial plants in helping to reduce the cost of finishing their products. It will be recalled that some years prior to the formation of the A. E. S. that bitterness and jealousy existed with the resulting loss of valuable solutions, as there were no means of counteracting this loss and expenditure of money. Today, however, the situation is much more favorable and we are in a position to accomplish far better results.

It is of the utmost moment that some arrangement should be affected as early as possible to have all of the employers who maintain plating departments be made acquainted with the educational features of the A. E. S. and abundant knowledge that is published in the Monthly Review. This is a suggestion well worthy of consideration although perhaps the solution is not so simple as appears upon its face.

Do the members fully realize the large amount of energy and self sacrifice that the Editor of our Review is donating in order to have the publication in the hands of our members each month. If we all would co-operate in the same manner this question of industrial unrest would not be so serious as today.

SYLVESTER P. GARTLAND, Supreme President.

FUNDAMENTAL PRINCIPLES OF THE A. E. S. "EDUCATION"

By one of the "Yesterdays" at Pittsburgh Branch Banquet.

Knowledge of today, compared to the knowledge of the "yesterdays," when the methods of the Plating Room were by the rule of "Thumb,"—a "hunk" of this, a "little" of that, experimentatism, floundering from one thing to another, until things worked "pretty good," then our mediocre fund of knowledge was locked in our bosoms as a "Shop Secret," and the plater of "Yesterdays," had no dealings with the other plater, lest some "solution," leak out.

Behold the change! Platers bound together, whose unwritten principles seem now to be, "It's more blessed to GIVE, than to receive." Reviews published whose pages are teeming with every secret of the craft, disclosed, not by the few, but by every brother who has by intelligence and hard, persistent work learned anything worth while.

Regular and frequent meetings of groups, whose object seems to be "Better Plating by Better Platers," on whose banner might be inscribed,

P R O G R E S S ,

thus the general level of knowledge is increased by practical illustrations of theories and problems worked out, by exchange of experiences, by lectures by capable and experienced men, by organizations of study classes within the society, and by school Boards of Public Education, with all the knowledge of federal research work to be had for the asking; all these, and much more could be written of the good things that are at the command of the plater of today, and which differentiates him from the plater of "yesterdays."

"All hail to the A. E. S. for the good it does do, can do, and will do, the fundamental principle of which is "EDUCATION," which interpreted for an "AMERICAN ELECTRO-PLATER" means "INTELLIGENCE, CAPABILITY, EFFICIENCY, elements which should be envied by every worker in the craft, and major recommendations to employers and a valuable asset for every member of the PROFESSION IN THE AMERICAN ELECTRO-PLATERS' SOCIETY.

EXTRACT FROM ADDRESS OF WILLIAM BARNETT:

The world today is largely dependent for its progress upon organized societies, such as fraternal orders, social orders and societies for scientific advancement. Much credit is due to any body of wage earners, working in any capacity, possessed of intelligence and ability to organize into a society contributing to the mutual benefit of themselves and the surrounding world, and making them more efficient.

Many of the achievements in the industrial world today, especially in the field of science and invention, have been the results of concentrated interest created by organized societies.

MAGIC FLUID

Notes by Edgar Cornell, Jr., Pittsburgh Branch

Mr. Lovering's claims for the current efficiency, and his disregard of Faraday's Law, interested me to the extent of checking his figures given in the Monthly Review, Feb., 1920.

While my experiments were not exhaustive enough to warrant any opinion as to the possible commercial value of the "Magic Fluid," they did prove that the "Magic Fluid" will have to attain some additional "magic" to upset Faraday's law.

In paragraph No. 7 it is claimed that the H. F. increases the cathode efficiency. In proof of this an electrolyte was made according to the Lovering formula and found to contain $NiSO_4$ $6H_2O$, 44 ounces; H. F. acid, 1¼ ounces boric acid, 2 ounces per gallon. The experiment was done in a beaker of 200 c.c. capacity with a copper cathode and standard nickel anode (92% ni), each electrode was 6 square inches in area. A very sensitive and newly calibrated ammeter was used.

In the first effort a lower current density than recommended was used in order to insure a margin of safety in obtaining the current efficiency. It was run for 15 minutes at 5 volts and 1.6 amperes, or 38.3 amperes per square foot. The cathode gained .2170 grm., or .19 ounces per square foot. This shows a current efficiency of 49+%. The anode lost .3320 grm. or 50% more than the cathode gained.

This test was repeated three times, showing practically the same results as to current efficiency, anode loss and toughness.

In pa agraph No. 8 it is claimed that the electrolytic anode is corroded as rapidly as the standard anode, but on investigating this it was found that the anode loss was only 1/10, the gain of the cathode using, of course, the high current density recommended.

These tests were made in the laboratory where the measuring instruments are not questionable.

In paragraph No. 10 Mr. Lovering claims that he gets .28 ounces of nickel on one lamp frame in 5 minutes (24 frames= 10 square feet, 6 V., 500 Amp.). The conditions were duplicated on a small scale and it was found to take 20 minutes to get that heavy a coat.

The indications are that Mr. Lovering's measuring instrument, or method of measuring, and possibly his enthusiasm, led him astray as far as Faraday's Law is concerned.

SUCCESSFUL METHODS

Chicago Branch

Question No. 2—Can fine gold be deposited upon polished silver and how should solution be: high or low in metal, weak or strong current, etc.?

Answer No. 2—Yes, it can be plated directly upon polished silver and your solution should be rich in metal and used warm for uniform color and best results.

BRASS PLATING

By H. A. B., Pittsburgh Branch

A few lines on brass plating which I think will be very interesting to some of the members.

The old methods that were used by some of the platers in doctoring brass solution, dating back to 1892, by dissolving sulphate of metals, adding them to the plating tank, and then adding cyanide of potassium. This method was very expensive and the results were very poor. It would take days for the metals to amalgamate and to give results. The solution at times would plate all kinds of colors. At that time some of the platers were not very successful with brass plating.

Then another method was discovered by dissolving sulphate of copper, and adding cyanide of potassium; then dissolving sulphate of zinc and adding cyanide of potassium. These solutions were mixed together and then added to the plating tank which always gave a uniform color but was very expensive. At that time there were some platers using carbonated metals.

By using sal soda to carbonate the sulphates the cost is brought much lower. Sal soda at that time sold for less than two cents a pound. Cyanide of potassium sold for twenty-five cents a pound, which makes a big difference in the cost.

There was a time spotting out on brass plated work was not known by the use of cyanide of potassium.

My experience on spotting out on brass plated work. The blame was put on pickling the casting, but there were castings that never went in the pickling acid. They spotted out after being brass plated. There are cyanide mixtures which I think is the cause of spotting out. There are methods used by platers that are very successful. As a plater, I have been very successful with brass solutions by taking up the carbonate metals with cyanide of potassium which amalgamates the metals together and then adding the solution which always plates a uniform color.

When the different cyanide mixtures came on the market it was very difficult with out the use of arsenic. Brass solutions with the use of arsenic are not suitable for all classes of work. To overcome the difficulty, I have been taking up the carbonated metals with ammonia, then adding cyanide and then adding to the solution which always give a uniform color.

Don't never let yourself be worried or hurried or flurried
If you do, you'll soon be buried,
Care will never kill a fool.
If the title life beset you, or fret you,
I'll bet you the Huddo will never get you
If you just keep cool. —H. A. B.

ELECTRIC CLEANING

By Henry Wiesner, Pittsburgh Branch

Our work consists chiefly of sheet zinc stampings of various shapes and sizes, some of which are to be nickel plated and some brass plated. In either case the work is cleaned in electric cleaners before plating. After experimenting with various formulas and cleaners, we have adopted a solution which, for our particular class of work, has given, and is still giving us, excellent results. The solution is kept near the boiling point by a steam coil which is insulated from the bath. It is prepared as follows:

Water	225 gal.
Sodium Carbonate	40 lbs.
Caustic Soda	20 lbs.
Sodium Cyanide	1 lb.
Sodium Silicate (Water Glass)	1 qt.

To replenish this cleaner it is only necessary to add from time to time as may be needed:

Sodium Carbonate	20 lbs.
Caustic Soda	10 lbs.
Sodium Cyanide	¼ lb.
Sodium Silicate (Water Glass)	1 pt.

The electrical connections are all soldered and taped and the anode hooks are soldered to the anodes. This is very important and too much stress cannot be laid on the fact that all electrical connections in a plating room should be soldered, thereby guarding against loss of current through corroded or loose connections. The anodes are of electrolytic copper, though no doubt sheet copper would do equally as well. It is possible also to use sheet iron anodes, but our experience has taught us that they do not give as good results as copper. A current pressure of 8 to 9 volts is used, and the work is left in the cleaner about two minutes, after which it is rinsed in cold water and immediately immersed in the nickel or brass bath as the case may be.

SUCCESSFUL METHODS

Chicago Branch

Question No. 1—Dr. Watts says that with 100% efficiency at both the cathode and anode there will be nothing deposited but nickel and no polarization except such as is due to difference in density in solution surrounding anode and cathode. Now, if it is possible to pass a current through a solution without decomposing it, we will have no hydrogen bubbles on the cathode, as none will be evolved. Is this possible?

This brought out a lot of discussion. But to answer it we need help. Kindly pass the word and see if there is a little light somewhere. (Mr. Editor, "HELP.")

ANALYSIS OF NICKEL ELECTROLYTE (DOUBLE SALTS)

By Edgar Cornell, Chemist, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Member Pittsburgh Branch.

Determination of Nickel.

Twenty-five to 50 c.c. of the sample are measured into a 200 c.c. tall form beaker and add about 25 c.c. of Ammonium Hydroxide, dilute with water to about 150 c.c. or enough to completely immerse the electrodes, and electrolyze with platinum gauze electrodes, at 1½ amperes for about 1 hour, using a stirring apparatus. When the nickel is apparently all precipitated or plated, extract a small amount of solution with a pipette and test with a solution of Dimethylgloxime; if this gives no test for nickel, remove the solution, washing the electrodes carefully with water and alcohol, dry and weigh. The weight—weight of electrode—Ni.

$$\frac{\text{weight} \times 100}{\text{Number c.c. of Sample} \times \text{Sp. Gr.}} = \text{per cent of Ni. by weight.}$$

This method is very accurate, but precautions must be taken not to electrolyze much longer than necessary as it will tend to give high results.

Determination of Nickel (Cyanide Method).

Twenty-five to 50 c.c. of sample are measured into a 600 c.c. beaker. Add about 15 gm. of citric acid. Dilute to about 400 c.c., when the citric acid is in solution. Make very slightly ammoniacal, then add 2 c.c. of a 20% potassium iodide solution and about 5 c.c. of silver nitrate solution from a burette. Add potassium cyanide solution until cloudiness disappears. Five c.c. more of silver nitrate are added and cloud is again cleared with potassium cyanide. The amount of potassium cyanide necessary for the second addition of silver nitrate, deducted from the first amount of cyanide equals the amount of cyanide necessary to react with the nickel.

$$\frac{\text{Number of c.c. of Cyanide} \times \text{factor} \times 100}{\text{Number of c.c. of Sample} \times \text{Sp. Gr.}} = \text{per cent of Ni. by weight.}$$

The factor for the cyanide is obtained by following the same procedure with a known solution or with a chemically pure nickel salt. A convenient strength of solutions may be made as follows:

KCn —22 grams per liter.
$AgNO_3$ — 4 grams per liter.

Sulphate Determinations.

This determination is usually calculated as SO_3 and then to the nickel as $NiSO_4$, but for the sake of simpler calculations we will consider it as SO_4.

Fifty c.c. of the sample is measured into a 400 c.c. beaker and made acid with 25 c.c. of Hydrochloric Acid. Dilute to about

250 c.c. and boil. Add 20 c.c. of a 10% Barium Chloride solution, hot, slowly and boil for 5 minutes. Leave settle and filter on ashless paper. Wash with hot water. Ignite and weigh $BaSO_4$.

$BaSO_4 \times .412 \times 100 =$ per cent of SO_4
Number c.c. of sample $\times$ Sp. Gr.

Chlorin and Sodium Chloride.

50 cc. of sample are measured into 400 c.c. beaker. Dilute to about 200 c.c. and add 5 c.c. of Nitric Acid. Boil and add 10 c.c. of 10% silver nitrate solution. Boil vigorously until silver chloride coagulates, then filter on a prepared Gooch Crucible with asbestos. Wash with hot water and dry in oven at 105° C. for one hour. Weigh, gain in weight over prepared crucible equals silver chloride.

$AgCl \times .247 \times 100 =$ per cent of Cl.
Number c.c. of sample $\times$ Sp. Gr.

$AgCl \times .408 \times 100 =$ per cent of NaCl.
Number c.c. of sample $\times$ Sp. Gr.

NH_4 Determination.

Fifty c.c. of sample are measured into a suitable flask and connected with a condenser. Add 50 c.c. of 10% solution of sodium hydroxide and heat flask, catching the distillate in 50 c.c. of a normal sulphuric acid solution. When the distillation is complete, add a few drops of Cochineal solution to the distillate and titrate with a normal sodium hydroxide solution until pink color appears. If the sodium hydroxide is exactly equal to the sulphuric acid, then sulphuric acid minus sodium hydroxide equals amount of sulphuric acid necessary to react with the ammonium hydroxide—therefore,

$(H_2SO_4 — NaOH) \times .018 \times 100 =$ per cent of NH_4.
Number c.c. of sample $\times$ Sp. Gr.

This is usually determined as NH_3, but as in the case of SO_3, we will consider it as NH_4 to make the subsequent calculations more simple.

Boric Acid and Free Sulphuric Acid Determinations.

Fifty c.c. of sample are measured into a 400 c.c. beaker. Dilute with water to about 200 c.c. Add 25 c.c. of glycerin and titrate with N/2 sodium hydroxide, using phenolphthalein as an indicator. After the end point is reached 10 c.c. more of glycerin are added. This usually causes the solution to become colorless. The end point with the sodium hydroxide is again obtained and the process repeated, until finally the addition of glycerin causes no further action upon the end point.

Number of c.c. of NAOH $\times .0214 \times 100 =$ per cent of H_3BO_3
Number c.c. of sample $\times$ Sp. Gr.

If, as is very often the case, there is free sulphuric acid present, the amount must be deducted from the Boric Acid determination to give the true percentage of H_3BO_3.

Free Sulphuric Acid Determination.

The Ni. determination $\times$ 2.635 = $NiSO_4$. The $NH_4 \times 3.666 = (NH_4)_2\ SO_4$. The sum of the SO_4 necessary to saturate the Ni and NH_4 deducted from the SO_4 determination equals the SO_4 that is present as free acid. This amount, multiplied by 1.011 = H_2SO_4.

To calculate the amount of different salts present in the electrolyte, and at the same time check the results. The sum of Ni + (total SO_4 — SO_4 of H_2SO_4 + NH_4 multiplied by 1.377 to account for the water of crystallization, will give the percentage of Nickel Ammonium Sulphate ($NiSO_4\ (NH_4)_2\ SO_4\ .6\ H_2O$) present in the solutions.

To check the accuracy of the analysis, each of the determinations multiplied by their respective factors should give the same result as their sum.

Ni $\times$ 6.724 = Ni $So_4\ (NH_4)_2\ SO_4\ .6\ H_2O$.

(Total SO_4 — SO_4 of free H_2SO_4) $\times$ 3.083 = $NiSO_4(NH_4)_2SO_4.6H_2O$

$NH_4 \times 10.964$ = $NiSO_4(NH_4)_2SO_4.6H_2O$

Sum $\times$ 1.377 = $NiSO_4(NH_4)_2SO_4.6H_2O$

Determination of Free Acid in Copper Sulphate Electrolyte.

Ten c.c. of sample are measured into 250 c.c. beaker. Dilute to about 100 c.c. with water and add a few drops of Dimethylamidoazo benzol (1% alcoholic solution).

This indicator masks the blue color of copper sulphate and gives the solution a pink color. Titrate this with N/2 sodium hydroxide solution until the pink color disappears.

Number of c.c. of NaOH $\times$ .0098 $\times$ 100 = per cent of H_2SO_4 by weight.
Number c.c. of sample $\times$ Sp. Gr.

SUCCESSFUL METHODS

Chicago Branch

Question No. 5—What is best formula for a bright silver solution? What is carbon disulphide and how do you use it?

Answer No. 5—A good, bright silver can be made from any good working silver solution by addition of a brightener, such as you ask about. Carbon disulphide is a combination of carbon and sulphur and is used as a solvent on rubber and as a brightening agent in silver. To prepare add ½ ounce liquid carbon disulphide to 1 gallon of old silver solution and shake daily three or four times for about eight or 10 days, then add to a working silver solution 1 ounce of this stock solution and brightener to every 50 gallons of solution and about once a week. Too much is detrimental to solution, turning anodes black, so use care in administering.

Chicago Branch, A. E. S.

CHEMICAL CONTROL—ITS APPLICATION AND VALUE IN ELECTRO-PLATING*

By Roy Willys Armour

It has long been realized that the control of the metal and addition agent content of a plating solution is very essential for obtaining good work. We have often heard the phrase, "with like conditions we secure like results," which means that a solution that will turn out good work today will do good work every day if we keep all factors constant.

We do not presume that a solution of a certain composition will give the same results on all classes of work. One could not find a formula for a solution which would be exactly suitable for his particular line of work without the necessary modifications to meet his requirements. The particular temperature, concentration of the solution and the current density required to yield the best results in practical plating can only be determined by experience and experimenting.

Until recently, and even at this time, the successful electroplater has been keeping his solutions agoing by merely a guess or a trust to luck. In these days of strenuous competition and exacting requirements there is not much room for the man who never knows from one day to the other, what his soluitons contain, nor how they are going to plate. Aimless and haphazard "doping" is gradually giving way to exacting scientific operation, so that the solutions may be maintained at their highest efficiency with the slightest attention.

To keep the various factors of a solution constant requires an individual with a knowledge of analytical chemistry. The Bureau of Standards, the various branches of the American Electroplaters' Society, the platers themselves and their helpers have gone to much trouble and expense to secure the necessary knowledge required for the application of chemical control.

We must remember that if the laboratory report of the analysis is to have its full meaning, various other factors, such as current density, and temperature, should receive more attention than is ordinarily given them in the commercial plating room. Where the current density continually varies we can readily see that little will be gained in the line of uniform deposits.

The application of chemical control to the plating solution is no easy task. No direct statements can truthfully be made regarding the sampling of solutions as this depends upon the amount of work passed through the bath. If samples of the solution are taken the latter part of each week, and analyzed, it is usually possible to bring them to the desired composition on the following day, which gives us a half-day to make repairs and adjustments to the electro-plating apparatus.

The samples are secured in eight ounce, properly labeled glass bottles by immersing midway to the bottom of the tank, thus a more representative sample of the solution is obtained.

*Read at Milwaukee Branch Banquet, March 19, 1921.

As to the methods of analysis to be used, those giving rapid results combined with accuracy are to be choosen above any others.

As a matter of information we may give a few of the most important solutions and the determinations to be made on each:

Nickel solution—metallic nickel, free acid, and total chlorides.

Copper solution—metallic copper, free cyanide or acid as the case may be.

Brass solution—metallic copper and zinc, free cyanide.

Silver solution—metallic silver, free cyanide, sometimes copper and zinc as in silver strike.

Zinc solution—zinc metal, free cyanide or acid as the case warrants.

We can not mention any standard point at which these solutions should be kept in regard to metal content, which will do for all purposes, here it becomes necessary for the plater to keep a constant watch on the class of work turned out, and also on the operating efficiency of the bath. When he notes very highly efficient work he should immediately take a sample of the solu- and have it analyzed, noting the current density, temperature, and other factors involved, and use the composition and factors as the standard point of the solution.

The following data may give some idea as to what they ought to contain:

Nickel—3.50 Ozs. 1.00 Ozs. Cl_2. Boric acid—½ Oz.

Copper—1.50 Ozs. Free Cyanide 1.00 Oz.

Brass—1.50 Ozs. Copper, .50 Oz. Zinc, 1.25 Ozs. Free cyanide.

Regarding the addition of metal to deficient baths, we find that the best and most practical method is to withdraw a portion of the solution, probably 10 gallons, and heat to boiling by passing live steam through the solution and then adding the required amount of necessary salts to bring the bath to its standard point. When all necessary additions are dissolved in this portion of solution it should be returned to the tank and the whole solution stirred and allowed to settle completely before using. It is understood that with cyanide solutions heating would be very destructive, so if a portion is withdrawn and the necessary chemicals and sodium cyanide to exist as free cyanide are added and allowed to dissolve completely before returning the solution to the tank, this method will be found very satisfactory. The weights of metallic salts necessary to replenish the solution are computed from the metal content of the salt.

The science of electroplating is young and is changing rapidly. We have chemists experimenting on solutions, electrical engineers improving the means of generating and handling of electricity, mechanics designing improved machinery; our progress seems to hinge upon the free application of the sciences.

NICKEL SOLUTIONS*

By R. J. Hazucha, Chicago Branch

In the past years we have witnessed a lot of disturbance in the nickel plating industry, especially amongst the platers themselves. The disturbance was caused by Nickel Sulphate or Single Nickel Salts and after experimenting with all kinds of formulas we are further from standardization than we were 15 or 20 years ago.

Today some of the platers are using strictly double nickel solutions, others are using strictly single nickel salt solutions, then there are a large number who are using a mixture of the two salts and they are all obtaining satisfactory results. It is the intention in this paper to show some phases of these solutions, I may not tell you anything new because it has been said there is nothing new under the sun, but if what I am presenting benefits anyone, I will feel repaid for my trouble.

Let us take, now, these two salts and analyze them for their advantages and disadvantages.

(1) Metallic content—double nickel salts contain 14.7% of metal or 2.35 ozs. per pound of salt. Single nickel salts contains 20.9% of metal or 3.33 oz. per pound of salt.

(2) Solubility—Under normal temperature about 12 oz. of double nickel salts can be dissolved in a gallon of water, a solution of this sort would have a metallic content of 1.75 of nickel per gallon, in using single salt three pounds can be dissolved per gallon, making the metallic content approximately 10 oz. per gallon, which seems high, but when satisfactory results are obtained this need not be an objection, neither need the cost be considered, especially when production and efficiency are the result.

An objection raised against single salt at times is that such a solution has a higher resistance, which is true if nothing else is added to the single salt. This, however, is not the case. We add additional agents or conducting salts to all of our plating solutions, and when sodium chloride is added to a single salt solution it immediately becomes a far better conductor and a more efficient solution than the double salt.

The character of deposits from single salt solutions or solutions that contain 50% or more single salts, and high purity anodes results in much closer grained deposits, this is sustained by the photographic production of such deposits by Dr. Blum, of the Bureau of Standards, who delivered a series of lectures on this subject some time ago, which most of you have heard.

The durability of such deposits is therefore, superior particularly since such deposit is less susceptible to corrosion.

We find that the metal content of a nickel solution or the kind of conducting salts used do not alone effect the characteristic properties of the electro deposit, the temperature and rate of deposition are more important factors.

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*Read at Milwaukee Branch Banquet, March 19th, 1921.

It is true that the current density which can be successfully applied in plating depends upon the density of the solution, but the cause which limits the flow of current which can be used in a solution of low metallic content can be reached in a high concentrated solution. If, for example, a nickel solution containing 12 ounces, double nickel salts per gallon and run at 70° F. it is found that three to four amperes per square foot is the right current to use on steel which must be bent or curved after plating, a higher current giving a deposit found to be too brittle.

The plater may then use a solution of higher metallic content and with a good conducting salt run at 70° F. and find that he can get satisfactory deposit using five to six amperes per square foot of cathode surface. If he should then further increase the current he would then experience the same difficulties in obtaining a hard deposit as were encountered in the double nickel salt solution. These figures are merely used relatively for example to show that it is as much possible to get a deposit of any degree of hardness using a rapid nickel plating solution, as when using a double nickel salt solution. The operator must pay attention to the temperature and rate of deposition of the different classes of work.

It sometimes happens that considerable difficulty is experienced in plating steel, cast iron, brass, copper and lead parts in certain solutions and where in large plating departments the conditions do not warrant having an assortment of different solutions, it has been found that the following formula is a very good one.

Water	1 gal.
Single nickel salt	8 oz.
Double nickel salt	8 oz.
Boracic Acid	3 oz.
Sodium Chloride	3 oz.

This solution has a metallic content of 2.84 oz. of nickel per gallon, plates nice and white. The deposits are soft and can be used for any class of work with the exception of plating zinc.

The up-keep of this solution is also simple. Possibly the best way of standardizing your nickel solutions is to have a 50 gallon barrel connected with a steam pipe, then weigh out enough chemicals for 50 gallons of solution, place in barrel and fill the barrel about two-thirds full and boil until all ingredients are dissolved, then fill the barrel full with water, and add the solutions to the tanks as they require additions. By using this method you will be able to keep your nickel solutions pretty well standardized.

One advantage about the formula outlined above is that it can be readily modified to any density that one may desire and in that manner make this solution adaptable to various classes of work, bearing in mind at all times the temperature and current density which has already been outlined above. This same formula, for instance, could be used with very satisfactory results on any class of work where a lighter or brighter class of

deposit is desired when the density is reduced by using two gallons of water instead of one, for the same formula which would reduce the metal content to 1.42 ounces or equivalent to a solution using 10 ounces of double nickel salts. Then again only ¾ gallon of water can be used and a solution would then contain 4.25 of metal and is a very good solution for heavy deposits.

On plumbing goods, actual experience has shown that when using the single nickel salts formula of approximately 10 ounces of single nickel salts per gallon with 3 ounces of boric acid and 2½ ounces chloride, the plating time has been reduced one-half and giving a deposit that can be buffed very easily without cutting through on any class of this work where there are sharp corners.

We also find through actual experience that some stove plants on gray iron casting use a formula of 24 ounces of single nickel salts per gallon of water with six ounces of boric acid and three ounces of sodium chloride which has resulted in reducing the time in the actual plating operation from 2½ hours down to one hour and giving a deposit that will readily stand a buffing operation with a 16-inch buff without cutting through on any of the high lights.

Investigation from actual experience, has shown that where large production is desired the use of nickel solution made from the single salts or at least with a preponderance of single nickel salts together with the other agents have worked out to very much better advantage, this is particularly true in motion plating. We refer here to the oscillation of cathode rods on plating tanks or putting the cathode in motion by any other scheme and in such cases, solutions containing as high as five ounces of metallic nickel per gallon have been used very successfully and it is not uncommon to find under such conditions instances where manufacturers are at the present time turning out the production in one tank that previously required two tanks.

Solutions of this sort are not at all difficult to maintain and the reference we have mentioned above with regards to current density and temperature quite naturally shows the importance of always having proper electrical instruments in the tank circuit. In this manner these conditions can be observed closely and we are better able to maintain the solutions at the proper point of metallic content in order to always be able to secure uniform satisfactory results.

SUCCESSFUL METHODS

Chicago Branch

Question No. 3—What causes an old silver solution containing 2 oz. metal and about 3 oz. free cyanide to stand 14% taining 2 oz. metal and about 3 oz. free cyanide to stand 14° cyanide only stands 8° beaume?

Answer No. 3—Difference in beaume reading in two solutions is caused by carbonates formed in old solution.

New York, N. Y., May 16, 1921.

Mr. H. H. Williams, Editor:

I have just received a notice from the Central Passenger Association that they have granted us the concession of a special rate of one and one-half to Indianapolis on the certificate plan. I am enclosing a copy of the notice.

May I urgently request you, if at all possible, to insert this notice in the May issue of The Review, so it will give our members plenty of time to make arrangements to attend the convention.

I presume we shall hear from the other trunk line associations this week regarding the same.

Yours in haste,

John E. Sterling, Secretary.

NOTICE!

Suggested advice to members of the organization respecting reduction authorized on the certificate plan for benefit of members and dependent members of their family.

A reduction of one and one-half fare on the "Certificate Plan" will apply for members and visitors attending the meeting of the American Electro-Platers' Society, to be held at Claypool Hotel, Indianapolis, Ind., and also for dependent members of their families, and the arrangement will apply from the following territory:

Central Passenger Association territory.

The following directions are submitted for your guidance:

1. Tickets at the regular one way tariff fare for the going journey may be obtained on any of the following dates (but not on any other date): June 25-July 1. Be sure that, when purchasing your going ticket, you request a CERTIFICATE. **Do not make the mistake of asking for a "receipt."**

2. Present yourself at the railroad station for ticket and certificate at least thirty minutes before departure of train on which you will begin your journey.

3. **Certificates are not kept at all stations.** If you inquire at your home station, you can ascertain whether certificates and through tickets can be obtained to place of meeting. If not obtainable at your home station, the agent will inform you at what station they can be obtained. You can, in such case, purchase a local ticket to the station which has certificates in stock, where you can purchase a through ticket and at the same time ask for and obtain a **certificate** to the place of meeting.

4. Immediately on your arrival at the meeting present your certificate to the endorsing officer, Mr. John E. Sterling, as the reduced fare for the return journey will not apply unless you are properly identified, as provided for by the certificate.

5. It has been arranged that the Special Agent of the carriers will be in attendance on July 1, from 8:30 a. m. to 5:30 p. m., to validate certificates. If you arrive at the meeting and leave for home again prior to the Special Agent's arrival, or if

you arrive at the meeting later than July 1, after the Special Agent has left, you cannot have your certificate validated and consequently you will not obtain the benefit of the reduction on the home journey. It is inferred that you will wish to attend all the sessions of the convention, and that you will, if possible, be present commencing the opening date of the meeting. However, so far as the validation of certificates is concerned, you should so time your going trip as to enable you to present certificate for validation prior to departure of the Special Agent of the railroads on the last validation date above named, for, while provision is made for validation of certificates if the required minimum of 350 are presented, as explained in the next paragraph a reduced fare ticket on the return trip is obtainable only upon surrender of a validated certificate. Certificates will be validated only on the dates above named, and during the office hours indicated. **No refund of fare will be made on account of failure to either obtain a proper certificate nor on account of failure to have the certificate validated.**

6. So as to prevent disappointment, it must be understood that the reduction on the return journey is not guaranteed, but is contingent on an attendance of not less than 350 members of the organization at the meeting and dependent members of their families, holding regularly issued certificates obtained from ticket agents at starting points, showing payment of regular one-way tariff fare of not less than 67 cents on going journey.

7. If the necessary minimum of 350 certificates are presented to the Special Agent, and your certificate is duly validated, you will be entitled up to and including July 6 to a return ticket via the same route over which you made the going journey, at one-half of the regular one-way tariff fare from the place of the meeting to the point at which your certificate was issued.

8. Return ticket issued at the reduced fare will not be good on any limited train on which such reduced fare transportation is not honored.

RESIGNATION OF CHAIRMAN OF PUBLICITY AND STANDARDS COMMITTEE

On March 19th, Mr. Walter Fraine, of Dayton Branch, on account of other responsibilities, resigned as chairman of above committee; after some correspondence in which President Gartland urged Mr. Fraine to reconsider, the Supreme President reluctantly accepted the resignation. The Supreme President then appointed Mr. John E. Sterling, 408 Grand Ave., Long Island City, N. Y., to fill the vacancy.

Here's our best wishes to the new branch society officers for next year. Capable men we are sure.

Are you one of the "four hundred?" You can now get into this class by attending the Indianapolis convention.

WHAT THE BRANCHES ARE DOING.

Pittsburgh

At our meeting of last Saturday evening, May 7th, the following were elected to serve for the ensuing year. Elliott S. Corbit, President; Abe Kantrowitz, Vice-President; S. E. Hedden, Secretary-Treasurer; Charles J. Rothfuss, Librarian; John Corbit, Joseph Weigand, and Roy L. Prunkard, Board of Managers.

It was decided to raise the annual dues to $6.00, the minimum allowed by the Supreme Society.

Mr. George Lantz, of the Dayton, Ohio, Branch, was a visitor and gave a good account of his work in Pittsburgh.

Boston.

Boston Branch met May 6th with Pres. Nihan in the chair. Prof. M. DeKay was elected an honorary member. After the regular order of business the banquet committee made final report; it proved a great success. The Secretary was also instructed to write to the Supreme Secretary, asking that Providence-Attleboro Branch act as our delegate to the convention. Past President Mackie gave his fifth talk on chemistry, which was very interesting. Then, after a discussion for about one hour, the meeting adjourned at 10:45 P. M.

Bridgeport.

The Bridgeport Branch held its scheduled open meeting and smoker April 15, 1921, with a very large attendance. Pres. J. M. Dunn in the chair.

One application was read and turned over to the Board of Managers.

A letter from Mr. Karl, stating that on account of illness he would be unable to be present and give his talk, but it is expected he will be with us at the next meeting. Mr. Dunn suggested that we start a question box, to help keep the meetings up to a red-hot point.

After the regular routine of business Mr. Dunn introduced Mr. Bissell, of the Bissell Varnish Co., who explained the photographic and transfer process such as used by the National Cash Register Co. in producing wood finishes, and also explained the proper way to use a spray so as to prevent pitting as pock marks on the work.

He then proceeded to give us a demonstration in producing a mahogany finish.

The result was a perfect invitation of mahogany. Mr. Bissell exhibited several samples of oak and mahogany finishes which were admired by all.

Mr. Slattery exhibited two player piano rolls made of steel tubing, which Mr. Bissell finished in mahogany.

At the conclusion Mr. Bissell was given a rising vote of thanks.

Mr. Buchanan was unable to appear personally but sent us two papers which were read, one on Electro Deposition of Nickel when it first became practical and of commercial value, the other on Nickel Anodes.

The papers were very interesting, and brought about quite a discussion on nickel anodes, which resulted in an invitation to have a joint party of the Bridgeport and Waterbury boys visit the foundry some Saturday in May to see how nickel anodes are cast.

Mr. Hogaboom said a few words on the corrosion of nickel anodes and also told of the advantages of chloride and fluoride nickel solutions, in regards to tensile strength and elasticity of the deposits.

Remarks were made by Mr. Hopkins and Mr. Rice, on the scale or outside shell of new nickel anodes, and advised sand-blasting of the anodes before putting them in the solution.

It was voted to send Mr. Buchanan a vote of thanks for his kindness in sending us his papers.

It is the aim of the Bridgeport Branch to have someone give us a talk at all of our future meetings.

Chicago.

We had a goodly number of members present and some visitors, our own H. Posbeck, R. Hazucha. Milwaukee Branch, and L. Schultz, all of whom took part in discussions.

Our president, C. E. Thornton, presided in his usual way, even if it was a farewell performance for him as he retires from the official family of Chicago Branch A. E. S. with our best wishes and highest regards for five or six years of work well done, but he says, after a little rest I will come back.

One applicant was elected to an associate membership.

Public installation and party Saturday evening, May 21st, and S. E. Hueuerfarth says everything is all set and when Sam says this, as he is a past master, it means something. So we can't miss it.

The librarian shot a lot of cards to our mellodion and following is way they looked when the boys' choir was through with them (see Successsful Methods).

Result of election of officers and delegates to convention: Geo. Burt, President; W. L. Bott, Vice-President; F. J. Hanlon, Secretary-Treasurer; Fred Greenwald, Librarian; Jerry De Grezio, Jos. W. Hanlon, C. B. Wrout, Board of Managers. Delegates: O. E. Servis, Geo. Burt, Frank J. Hanlon; Alternates: C. Thornton, Jacob Hay, H. H. Posbeck.

Cleveland.

The regulars have been keeping up the attendance at our meetings. The April meeting was better attended than usual and we had some very interesting discussions on the papers to be published in June or "Cleveland Number."

Mr. Singler, our librarian, is right on the job and is getting the papers for our number "lined up."

We will have a very interesting paper at the convention, and several of our members will attend.

Detroit.

Regular meeting held at Cass School, Friday, May 6, with Pres. Kutzen in the chair. After disposing of the regular order of business we elected the following officers: Pres. L. P. Brockway; Vice-President, O. H. Phelps; Secretary and Treasurer, E. Woodmansee; Librarian, M. Philips; Sergeant at-Arms, E. Hartz; Board of Managers: H. S. Brockway, A. E. Shepherd, J. Flanagan; Delegates to the Indianapolis Convention, H. S. Brockway, Chas. Cequin, M. Philips; Alternates, A. E. Shepherd and Chas. Cunningham.

A general discussion of the convention followed. Mr. Brocknay of the Ford Motor Co., exhibited samples of copper deposit by immersion 10 thousands deposit on aluminum; he also exhibited samples of rust proofing by the Udylite Process. The meeting adjourned with everyone enthused over the coming convention.

Grand Rapids.

Grand Rapids Branch met as usual on May 9th.

Attendance was very small but discussion was interesting along two lines, Bright Silver and Hot Copper cleaning and plating solutions.

Some of our members are skeptical as to possibility of securing a deposit of that class that will be rapid, firmly adherent and heavy. One member being of the opinion that no copper cyanide solution would deposit under any circumstances, a deposit that would be as thick as a 40 minute, 1 volt, acid copper deposit, and at the same time do a thorough job of cleaning, without making a deposit that would be rough. We would appreciate letters on this subject mailed to our secretary.

Grand Rapids Branch met May 11 at the usual place. The following officers were elected for the ensuing year:

President, Charles Whalley; Vice-President, Alex Rickson; Secretary-Treasurer, Walter J. Allen; Board of Managers, Thomas Oates, Charles Poe, Mr. McMeekin; Librarian, Charles Poe.

Indianapolis.

The Branch held its regular meeting May 14th, with Pres Hennessey presiding. The attendance was good.

One applicant was elected to membership. It was decided that we re-elect all the old officers unanimously. They are as follows: President, R. Hennessey; Vice-President, F. McDonald; Secretary-Treasurer, Louis Mertz; Librarian, B. D. Aufderheid; Board of Managers, Geo. Becktel, F. McDonald and R. Mc-

Cracken. Convention delegates elected were: Wm. Lamoureaux, B. D. Aufderheid and Geo. Barrows; Alternates, C. Cromer, H. Maze and F. McDonald. Reports of convention committee were listened to with interest, especially the program as outlined. The boys are well pleased with the efforts put forth by the ladies for the entertainment of the lady visitors.

Milwaukee.

The Milwaukee Branch held their annual election of officers with the following result: President, L. H. Armour; Vice-President, J. S. Guttman; Secretary-Treasurer, Robt. Steuernagel; Librarian, Daniel Witlig. Board of Managers, R. Hazucha, A. E. Koehler and Frank Marx. Watch us grow the next year. Plans have been started for a family picnic this summer. A committee has been appointed to send a letter to all manufacturers doing electro-plating advising them of Indianapolis Convention and its benefits to foreman electro-platers.

New York.

President Sterling presided at the April meetings of New York Branch of the A. E. S. Mr. P. J. Schening's application for active membership was referred to the Board of Trustees. The following problems were lengthily discussed. The prevention of Rose Gold darkening upon lacquering. The best method to relieve Jay Gold. The best method of producing Statuary Bronze on large bronze castings. The advantage of potassium cyanide over sodium cyanide in electro plating solutions.

Philadelphia.

Philadelphia Branch met May 6 with president in the chair. The following officers were installed for the year 1921-22. Pres. George Gehling; Vice-President, Martin Smith; Secretary and Treasurer, Philip Uhl; Trustees, Chas. F. Bayer, Jacob Liebman, George Keif; Librarian, J. M. Kreider. Delegate to convention, Philip Uhl.

The problems discussed were: Black on iron and steel as a dip; Removing enamel from auto parts; What is the cause of baume rising in sulphuric acid pickle.

St. Louis.

At our regular meeting, held May 7th, Vice-President C. T. McGinley presided, it being impossible for C. L. Weggandt to attend.

One application for membership was received and one applicant elected to membership. The convention "Booster Committee" was on the job and St. Louis will be well represented at Indianapolis.

The officers elected for next term were: President, C. T. McGinley; Vice-President, F. Horath; Secretary-Treasurer, H. H. Williams; Librarian, G. Lamkemeyer; Board of Managers,

F. E. Terrio, E. J. Musick and H. Deubelbeis. Delegates to convention, H. H. Williams, E. J. Musick and E. W. Heil; Alternates, C. T. McGinley, J. H. Jordan and Wm. Flannery.

Toronto.

Our April meeting was presided over by our president, Thos. O'Keefe.

One application for active membership was received and four candidates were elected to membership.

Mr. Magill, the librarian, reported the purchase of one copy of the "Modern Electro-Plater," by "Coggeshall" and each one of our members will have the privilege of reading it and will therefor be able to judge for himself whether the book is good, bad or indifferent.

Nomination of officers for the ensuing term then took place as also did the nomination of delegates to the forthcoming convention in Indianapolis, in which every member took part in nominating some other member for one office or another.

ELECTED TO MEMBERSHIP.

Boston.

Luigi Gilberti.....53 Clifton St., N. Cambridge, Mass.
Wm. Simonetti.....72 Newbury St., W. Somerville, Mass.

Chicago.

Geo. R. Langer.....2439 Lexington St., Chicago, Ill
Ellsworth Widerick.....1212 S. Oakley Blvd., Chicago, Ill.

Connecticut Valley.

Wm. M. Legate.....80 Orange St., Hartford, Conn.
Geo. H. Cartlidge.....123 Boulevard, Hartford, Conn.
E. N. Miller.....53 Sargeant St., Hartford, Conn.
M. J. Connors.....41 Niles St., Hartford, Conn.
John Jacobson.....27 Wakefield St., New Britain, Conn.
James A. Bagshaw.....39 Grand St., New Britain, Conn.
F. B. Harvey.....82 Orange St., Meridan, Conn.
C. D. Munson.....142 Lombard, St., New Haven, Conn.
J. H. Bissland.....Box 156, Highland Sta., Springfield, Mass.
Saml. Paul.....27 Silver St., Springfield, Mass.

Grand Rapids.

C. J. Boon.....280 W. Bridge St., Grand Rapids, Mich.
John C. Carlson.....Sparta, Mich.

Milwaukee.

Roy Willis Armour.....1703 North Ave., Milwaukee, Wis.
Louis H. Zingler.....2606 Hadley St., Milwaukee, Wis.
Henry C. Hurtig.....542 16th St., Milwaukee, Wis.
Wm. Kielberg.c-o Fond du Lac Plating Wks., Fond du Lac, Wis.

New York.

Ben Cross.....256 Division Ave., Brooklyn, N. Y.
Thomas Stretch.....109 East 116th St., New York, N. Y.

Philadelphia.

D. J. Rathbone.....2658 W. Colorado St., Philadelphia, Pa.

Providence—Attleboro.

W. N. Auclair.....16 Railroad St., Attleboro, Mass.
Adolph W. Alsfeld.....Shawmut Beach, R. I.

Syracuse.

Chas. Pease.....146 Tenner St., Little Falls, N. Y.

Toronto.

Frank H. MaIlveen.....13 Bloem Ave., Toronto, Ont.
Geo. Youngs.....347 Huron St., Stratford, Ont.
Wm. W. Young.....13 Brunswick St., Brantford, Ont.
Chas. E. Beltz.....Eagle House, Winston, Ont.

APPLICATIONS FOR MEMBERSHIP

Bridgeport.

Geo. J. Bell (active).....1857 Fairfield Ave., Bridgeport, Conn.

Milwaukee.

Wm. C. Brandt (active).....1028 Center St., Milwaukee, Wis.

New York

P. J. Schenings.....22 Onderdonk Ave., Brooklyn, N. Y.

St. Louis.

L. Beeding (associate).....5928 Maple Ave., St. Louis, Mo.

Toronto.

Henry C. Ives (active).....390 William St., London, Ont.

REINSTATED

Chas. Shraishun.....2534 Collins St., Philadelphia, Pa.

TRANSFERS

H. R. MacFayden.....From Bridgeport to Conn. Valley Branch
G. E. Vilberts.....From Bridgeport to Conn. Valley Branch
E. N. Stephenson.....From Bridgeport to Conn. Valley Branch

SUSPENDED

N. E. Brewerton.....New York Branch
J. Bernath.....New York Branch
Jack Burke.....New York Branch

ALL ABOARD FOR INDIANAPOLIS

Oh listen, ye platers, and you shall hear,
About the Convention, that's now so near;
How the last two days, in the month of June
And the first of July, that is coming so soon,
Indianapolis will do herself grand
And entertain platers from all over the land.
Indiana's big town wants you for its guest
And will give you a time of the very best, best,
With lots of fun and some educating
For everyone interested in plating.
You miss half your life, if you miss this big time,
And if you don't come, it is simply a crime,
For the cream of Electro Chemical science
The men in whom we have got most reliance,
Who shine in the plating world—bright as the sun,
The guys who can tell us how things should be done,
Will be there from factory, office or college
And freely and cheerfully give from their knowledge.
You'll enjoy this feast surely, unless you're a rummy,
But feats there will be which are more for the tummy;
Plating exhibits will be there displayed
In all kinds of metals, finish and shade.
There'll be nothing left undone when the time arrives
To give all the platers the time of their lives.
The ladies are welcome—'twill be one great spree,
A gladsome and frolicsome big jamboree;
So when the time comes, just forget all your woes,
Just taller your boots and brush up your clothes,
Tell the neighbors next door to look after the cat,
Collect up your suit-case, your wife and your hat,
So call up your boss and just casually mention
That you're going to the Platers' Big Annual Convention.

HEDLEY J. RICHARDS.

ANNUAL CONVENTION
American
Electro-Platers' Society

HOTEL CLAYPOOL, - INDIANAPOLIS, IND.

June 29-30, July 1-2, 1921

B. D. Aufderheide, 635 Kentucky Ave , Chairman Educational Committee
Geo. Barrows, 1529 Sheldon St., Chairman Publicity and Exhibit Committee
Frank McDonald, 615 LaGrande Ave., Chairman Entertainment Committee
James Walsh, 547 Livingston Ave , Chairman Transportation Committee